

**DETAILED ACTION**

Claims 1-3, 5-6, 8-9 and 11-17 are pending in the application. Claims 1-3, 5-6, 8-9 and 11-17 are rejected.

***Information Disclosure Statement***

The Examiner has considered the Information Disclosure Statement(s) filed on May 18<sup>th</sup>, 2011.

***Response to Amendment / Argument***

Applicant's amendment to claim 1 to clarify the location of the carbon-carbon multiple bonds has overcome the rejection of claims 1-3, 5-9, 13-14 and 16-17 under 35 USC 112 2<sup>nd</sup> paragraph as indefinite. Accordingly, this rejection has been withdrawn.

Beginning on page 6 of the response filed May 10<sup>th</sup>, 2011, Applicant traverses the rejection of claims 1-3, 5-9 and 11-17 under 35 USC 103(a) over over U.S. Patent No. 4,874,890 by Kato et al. in view of Sajiki et al. Synlett. 2002, No. 7, 1149-1151 and in further view of Garnett et al. Aust. J. Chem. 1961, 14, 441-448 and in further view of Garnett et al., Journal of Catalysis, 1963, 2(4), 339-347 and in further view of U.S. Patent No. 4,591,626 by Kawai et al. This rejection has been withdrawn from claim 7 as this claim has been cancelled.

On pages 6-7, Applicant discusses the scope of the instantly claimed methods. Applicant states on page 6 that by "using the catalyst activated prior to the deuteration reaction, the compound having one or more multiple bonds [...] can be deuterated at a significantly higher deuteration ratio

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than the compound deuterated with an inactivated catalyst, and also, the compound can be deuterated without reducing the double bond [...]." Garnett et al. teach the motivation to activate catalysts and the reduction of double bonds has been addressed by the examiner in the rejection. The points raised by Applicant are neither persuasive nor unexpected.

Beginning on page 7, Applicant discusses the Kato reference and describes the teachings of the references and the lack of catalyst activation and concludes "claim 1 is distinguished from Kato." The examiner agrees that claim 1 is distinguished from the Kato reference taken alone. One cannot show nonobviousness by attacking references individually where the rejections are based on combinations of references. See *In re Keller*, 642 F.2d 413, 208 USPQ 871 (CCPA 1981); *In re Merck & Co.*, 800 F.2d 1091, 231 USPQ 375 (Fed. Cir. 1986).

Further on page 7, Applicant discusses the Sajiki reference and describes the teachings and the fact that Sajiki teaches the deuteration of a compound lacking a non-aromatic carbon-carbon multiple bond. Applicant concludes that "Because the deuterated compounds are completely different from each other, there is no reasonable basis to assume that one method applicable to the particular first group of compounds can provide similar results when applied to a second group of compounds that have a different structure and would have a different reactivity." For this reason, Applicant asserts that there is no reason to combine the references. The examiner has not stated that a person of ordinary skill in the art would be motivated to use the procedure of Sajiki on a compound instantly claimed, but rather that a person having ordinary skill in the art would have been aware from the teachings of Sajiki that hydrogen increases the reactivity of metal catalyzed

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H-D exchange reactions. The examiner has particularly explained the differences between the compounds and the fact that a person of ordinary skill in the art would have been motivated to pre-activate the catalysts to accommodate the substrate of Kato et al.

On page 8, Applicant discusses Garnett et al. Aust. J. Chem. 1961, 14, 441-448 (Garnett I) and the fact that it is drawn to compounds different from those of Kato. Applicant's traversal is similarly not persuasive since Garnett I teaches one of ordinary skill in the art the importance of the activation of platinum catalysts. Applicant then compares the compounds of Sajiki and the compounds of Garnett I and asserts there is no reason to combine them. This traversal is not persuasive since the references provide knowledge about H-D deuterium exchange reactions and the references provide no indication that the activity of the catalysts is in some way only achieved if a certain substrate is utilized. A person of ordinary skill in the art would expect teachings on the activity of such catalysts to be of general importance. On pages 8 and 9, Applicant discusses Garnett et al., Journal of Catalysis, 1963, 2(4), 339-347 and makes the same assertions based on the substrates used in the reference. For the reasons discussed above, this traversal is not found persuasive.

Beginning on page 9, Applicant discusses the teachings of the Kawai reference. Applicant first states that since the compound taught by Kawai et al. lacks aromatic rings or polydienes and for this reason there is no basis to combine Kawai with Garnett I or Garnett II. This traversal is similar to those discussed above in that the prior art teachings of H-D exchange reactions would not be viewed by one of ordinary skill as being limited to the particular substrates chosen for model systems or proof of principle

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studies in the prior art references. Continuing on page 9, Applicant compares the polymerization reaction discussed in Kawai and the deuteration reaction of Kato. Applicant discusses the use of Kawai's acrylate and methacrylate substrates in the instant deuterations; however, the examiner has not suggested a person of ordinary skill in the art would be motivated to perform such a reaction. Rather, a person of ordinary skill in the art would have been motivated to deuterate tricyclo[5.2.1.0<sup>2,6</sup>]decan-8-ol. Kawai et al. teach in column 2 (line 53) through column 3 (line 3) that the alcohol can be condensed to form an ester, which can then be polymerized.

Further on page 9, Applicant compares the compounds in Sajiki with the acrylate and methacrylate monomers of Kawai and from there suggests a lack of reason to combine them. The difference between the structure of compounds and the teachings of H-D exchange reaction conditions has been addressed above and is unpersuasive.

On page 10, Applicant again discusses the compounds and their structures and states "Even among alicyclic compounds having no carbon-carbon double bond, the deuteration ratios vary when a number of carbon atoms, structures of the compounds, and substituents thereof differ from each other (...). Thus, there is no reasonable basis to assume that the compounds of Kato, Sajiki, Garnett I, and Garnett II can be deuterated similarly to each other and similarly to tricyclo[5.2.1.0<sup>2,6</sup>]decab-8-ol of claim 11." It is unclear if by "deuterated similarly" Applicant means with similar results or with similar methods. In either case the traversal is unpersuasive. A person of ordinary skill in the art would expect variations between different compounds using the same method and Applicant has provided no evidence that any methods instantly claimed give results that would be considered unexpected. The prior

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art teaches structurally distinct compounds that can be deuterated with transition metal catalysts and hydrogenation conditions and accordingly with a given method would reasonably expect it to be useful for deuterating different compounds even if different yield, etc. would be obtained.

Continuing on page 10, Applicant discusses the deuteration of the acrylate and methacrylate compounds of Kawai; however, the instant rejection does not discuss or suggest that such substrates would be obvious.

For these reasons, the rejection of claims 1-3, 5-9 and 11-17 under 35 USC 103(a) over over U.S. Patent No. 4,874,890 by Kato et al. in view of Sajiki et al. Synlett. 2002, No. 7, 1149-1151 and in further view of Garnett et al. Aust. J. Chem. 1961, 14, 441-448 and in further view of Garnett et al., Journal of Catalysis, 1963, 2(4), 339-347 and in further view of U.S. Patent No. 4,591,626 by Kawai et al. in maintained.

***Claim Rejections - 35 USC § 103***

The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negatived by the manner in which the invention was made.

Claims 1-3, 5-6, 8-9 and 11-17 are rejected under 35 U.S.C. 103(a) as being unpatentable over U.S. Patent No. 4,874,890 by Kato et al. in view of Sajiki et al. Synlett. 2002, No. 7, 1149-1151 and in further view of Garnett et al. Aust. J. Chem. 1961, 14, 441-448 and in further view of Garnett et al., Journal of Catalysis, 1963, 2(4), 339-347 and in further view of U.S. Patent No. 4,591,626 by Kawai et al.

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Determining the scope and contents of the prior art. (See MPEP § 2141.01)

Kato et al. teach methods for the production of deuterated methyl methacrylate in examples 4-6 by the treatment of methyl methacrylate with heavy water in the presence of a platinum, rhodium, palladium or ruthenium catalyst.

Ascertainment of the differences between the prior art and the claims. (See MPEP § 2141.02)

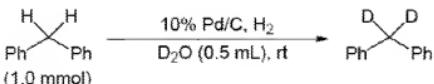
The differences between the claims and the prior art are that:

- (1) the claims require that "the catalyst is a catalyst activated in advance before the reaction step is performed;"
- (2) the claims are drawn to the deuteration of analogous products and the products themselves in claims 3, 11, 12 and 15.

Finding of prima facie obviousness --- rationale and motivation (See MPEP § 2141.02)

The instant claims require that "the catalyst is a catalyst activated in advance before the reaction step is performed." Therefore, if the catalysts used by Kato et al. had been pre-treated with H<sub>2</sub>, the instant claims would be anticipated. The activation of hydrogen catalysts with hydrogen in deuteration reactions is well-known and well-documented in the art. Sajiki et al. teach the following deuteration reactions where (page 1149, right column) "hydrogen was found to dramatically activate the reactivity of the Pd-C-catalysed H-D exchange reaction":

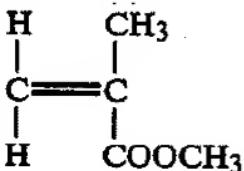
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Entry	H <sub>2</sub>	Time (d)	D content (%) <sup>b</sup>
1	None <sup>c</sup>	1	0
2 (1 <sup>st</sup> run)	Balloon	1	66

In the reaction taught by Sajiki et al., the substrate lacked any double bonds that would be highly susceptible to reduction in the presence of hydrogen gas and Pd/C. Therefore, the fact that the palladium catalyst had not been pre-treated with hydrogen was of no consequence to the reaction.

Garnett et al. (1963) teach the important of activation of platinum catalysts in their study to (page 339) "develop improved methods of catalysts activation (reduction of platinum oxide), which would yield catalysts possessing suitable activity and high reproducibility." Garnett et al. (1961) teach procedures where metal catalysts are pre-treated with deuterium gas on page 443 (Experimental section) where the authors state "Deuterium oxide was used in preference to deuterium gas since the latter by simultaneous hydrogenation of the species complicates the identification of the deuterated products." Methyl methacrylate has the following structure:



Accordingly, a person having ordinary skill in the art would expect that if hydrogen or deuterium gas were added to the reaction system of Kato et al.,

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the double bond of methyl methacrylate could be susceptible to reduction.

With the motivation of activating the metal catalysts as taught by Sajiki et al. and Garnett et al. without risking hydrogenation of methyl methacrylate, a person having ordinary skill in the art would have been motivated to pre-treat the metal catalysts of Kato et al. with hydrogen or deuterium gas and then subsequently add the methyl methacrylate substrate to the system after removal of the hydrogen or deuterium gas source.

With respect to claims 3, 11, 12 and 15 which are drawn to the deuteration of products and deuterated products other than methyl methacrylate, the use of analogous reactants in a known process is *prima facie obvious*. In re Durden, 226 USPQ 359 (1985). Once the general reaction has been shown to be old, the burden is on Applicants to present reasons or authority for believing that a group on the starting material would take part in or affect the basic reaction and thus alter the nature of the product or the operability of the process. In the instant case, Sajiki et al. teach that under the instant conditions, benzylic positions can be deuterated at room temperature. Kato et al. teach that allylic and alkenyl positions can be deuterated without hydrogen or catalyst pre-activation at temperatures of 85 - 120 °C. A person having ordinary skill in the art in modifying the procedure of Kato et al. to activate the catalyst by pre-treatment with hydrogen or deuterium gas would have been motivated to use the procedure on additional compounds with the reasonable expectation that deuteration could be obtained and modulated with increases or decreases in temperature for various types of substrates. A person having ordinary skill in the art in seeking to develop deuterated tricyclo[5.2.1.0<sub>2,6</sub>]decan-8-ol for use in optical elements (See U.S. Patent No. 4,591,626 by Kawai et al., abstract where polymers of tricyclo[5.2.1.0<sub>2,6</sub>]decan-8-yl methacrylate are useful for

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optical elements) would have been motivated to use the procedure of the prior art with catalyst pre-activation or in the presence of hydrogen or deuterium gas at elevated temperatures to obtain deuterated tricyclo[5.2.1.0<sup>2,6</sup>]decan-8-ol with a reasonable expectation of success.

In looking at the instant claimed process as a whole, as stated in In re Ochiai, 37 USPQ 2d 1127 (1995), the claimed process would have been suggested to one skilled in the art.

One skilled in the art would thus be motivated to utilize the process of the prior to arrive at the instant claimed process with the expectation of producing deuterated compounds. The instant claimed invention would have been suggested to one skilled in the art and therefore, the instant claimed invention would have been obvious to one skilled in the art.

#### ***Conclusion***

**THIS ACTION IS MADE FINAL.** Applicant is reminded of the extension of time policy as set forth in 37 CFR 1.136(a).

A shortened statutory period for reply to this final action is set to expire THREE MONTHS from the mailing date of this action. In the event a first reply is filed within TWO MONTHS of the mailing date of this final action and the advisory action is not mailed until after the end of the THREE-MONTH shortened statutory period, then the shortened statutory period will expire on the date the advisory action is mailed, and any extension fee pursuant to 37 CFR 1.136(a) will be calculated from the mailing date of the advisory action. In no event, however, will the statutory period for reply expire later than SIX MONTHS from the mailing date of this final action.

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Any inquiry concerning this communication or earlier communications from the examiner should be directed to MATTHEW COUGHLIN whose telephone number is (571)270-1311. The examiner can normally be reached on Monday through Thursday from 12:00 pm - 8:00 pm.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Joseph McKane can be reached on 571-272-0699. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see <http://pair-direct.uspto.gov>. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free). If you would like assistance from a USPTO Customer Service Representative or access to the automated information system, call 800-786-9199 (IN USA OR CANADA) or 571-272-1000.

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